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Theorizing Behavioral Law and Economics: A Defense of Evolutionary Analysis and the Law

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THEORIZING BEHAVIORAL LAW AND ECONOMICS: A DEFENSE OF EVOLUTIONARY ANALYSIS AND THE LAW

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Behavioral law and economics (BLE) provides a steady stream of empirical evidence that counters the predictions of law and economics. Despite this research and data, however, many theorists argue that BLE ultimately fails because it posits no underlying theory. This Note argues that perspectives from evolutionary biology, evolutionary psychology, and the brain sciences can provide the missing motivational theory for BLE's empirical findings. The Note also examines the implications a more consistent and reasoned consideration of evolutionary analysis and the law (EA) has for our legal regime. In theorizing BLE and defending EA, this Note aims to show how evolutionary analysis can supplant law and economics in those instances where the latter's predictions prove false and its incentive structure fails to motivate behavior.

INTRODUCTION

Law and economics rested in a fairly comfortable place from the 1970s to the mid-1990s. Those challengers who attempted to chip away at its main tenets, primarily the rational actor model and expected utility theory, largely failed. Eventually, in a Kuhnian sense, law and economics became the new analytical paradigm in legal studies. As a result, law schools hired more economists, law students struggled with Coase, and Posner found his way to the Seventh Circuit.

Although the counterarguments fell short, it is clear that explanatory gaps riddle economic theory. After all, if economics predicted all behavior, other social sciences would likely be laid to rest. And if law and economics' forecasts were absolute, our legal rules and decisions would be exact and organize society into clear arrangements of entitlements and duties. Judges would draft perfect opinions, legislators would rarely repeal laws, and people, in a state of Coaseian bliss, would negotiate the night away.

Unfortunately the picture of law and economics is not so rosy. Simply stated, people do not act as rational choice forecasts. Behavioral law and economics ("BLE"), one of the newest camps in legal studies, makes this particularly salient through empirical

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observation.[1] BLE, for example, whittles away at expected utility theory.[2] This central tenet of economics holds, "[F]or each available option, the expected payoff that would be obtained if the alternative is chosen is calculated. . . . [T]he expected payoff of one option [is determined] by summing the products of the probabilities and the values of outcomes contingent on probabilities."[3] Based on this calculus, a rational actor will choose the option with the highest expected payoff by balancing preferences and evaluating risk.

BLE's empirical data show that in fact people often do not choose the path to the highest expected payoff.[4] BLE categorized these departures from rational action and labeled them a function of cognitive biases, heuristics, and bounded rationality, willpower, and self-interest.[5] An example of these defects in the rational actor model comes from BLE's discussion of expected utility theory. One explanation for our inability to act economically stresses that bounded rationality[6] limits the brain's ability to capture complex statistical principles.[7] Consequently, individuals cannot perform the probabilistic calculation that expected utility demands.

BLE points out the limits of neo-classical economics with tangible empirical data.[8] In doing so, it shows that legal policies predicated on the assumption that people act economically should, in some situations, be altered in order to best direct behavior. In this sense, BLE should be viewed as a path "to new and

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1. Daniel A. Farber, *Toward a New Legal Realism*, 68 U. CHI. L. REV. 279, 282–83 (2001) (book review) ("The contribution of the behavioralists is to bring to bear an increasingly large and persuasive body of experimental evidence . . . that rational choice theory can be a poor predictor of human behavior."). For an introduction to behavioral law and economics, see BEHAVIORAL LAW AND ECONOMICS (Cass R. Sunstein ed., 2000).

2. Expected utility theory was first formulated by John von Neumann and Oskar Morgenstern. *See* JOHN VON NEUMANN & OSKAR MORGENSTERN, THEORY OF GAMES AND ECONOMIC BEHAVIOR (1947).

3. Catrin Rode & X.T. Wang, *Risk-Sensitive Decision Making Examined Within an Evolutionary Framework*, 43 AM. BEHAV. SCIENTIST 926, 927 (2000). While Rode & Wang do not fall into the BLE camp, their work discusses behavioral economics.

4. *See, e.g.*, Christine Jolls et al., *A Behavioral Approach to Law and Economics*, *in* BEHAVIORAL LAW AND ECONOMICS, *supra* note 1, at 13, 50.

5. *Id.* at 50. In coming to this explanation, BLE drew from prior works in psychology including Amos Tversky & Daniel Kahneman, *Judgment Under Uncertainty: Heuristics and Biases*, *in* JUDGMENT UNDER UNCERTAINTY: HEURISTICS AND BIASES 3 (Daniel Kahneman et al. eds., 1982) and Herbert A. Simon, *A Behavioral Model of Rational Choice*, 69 Q.J. ECON. 99 (1955).

6. For a detailed discussion of bounded rationality see *infra* Part II.

7. Rode & Wang, *supra* note 3, at 928; *see also* Tversky & Kahneman, *supra* note 5, at 7–11.

8. *See generally* BEHAVIORAL LAW AND ECONOMICS, *supra* note 1.

improved understandings of the real-world effects of law, and ultimately to better uses of law as an instrument of social ordering."[9]

Despite BLE's powerful observations, law and economics criticized the movement and skeptically scrutinized its findings. Richard Posner, while lauding the intellectual value of BLE,[10] argued that what little BLE gains through observation it loses in parsimony. He noted that "in theory-making, descriptive accuracy is purchased at a price, the price being loss of predictive power. The rational-choice economist asks what 'rational man' would do in a given situation, and usually the answer is pretty clear. . . . But it is profoundly unclear what 'behavioral man' would do in any given situation."[11]

Posner more centrally propounded that BLE fails as a scientific endeavor because it lacks a theory. He posited that:

> [BLE] is undertheorized because of its residual, and in consequence purely empirical character. Behavioral economics is defined by its subject rather than by its method and its subject is merely the set of phenomena that rational-choice models (or at least the simplest of them) do not explain. It would not be surprising if many of these phenomena turned out to be unrelated to each other, just as the set of things that are not edible by man include stones, toadstools, thunderclaps, and the Pythagorean theorem. Describing, specifying, and classifying the empirical failures of a theory is a valid and important scholarly activity. But it is not an alternative theory.[12]

Posner held that because BLE is devoid of theory, it is unfalsifiable and accordingly, under the rubrics of science, useless.[13]

Posner is right; behavioral law and economics is undertheorized. This, however, does not obviate BLE's findings because a theory may very well come *ex post.* In fact, a theory that comes after observation may be sounder than others because it avoids the explanatory equivalent of Heisenberg's Uncertainty Principle.[14] While searching for information consistent with a

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9. *Id.* at 10.

10. Richard A. Posner, *Rational Choice, Behavioral Economics, and the Law,* 50 STAN. L. REV. 1551, 1551 (1998) ("I don't doubt that there is something to behavioral economics, and that law can benefit from its insights.").

11. *Id.* at 1559.

12. *Id.* at 1559–60.

13. *Id.* at 1560–61.

14. For more on Heisenberg's Uncertainty Principle see WERNER HEISENBERG, THE PHYSICAL PRINCIPLES OF THE QUANTUM THEORY (1930).

theory, researchers often skew the data they obtain. The aims of the theoretical project distort the true nature of empirical evidence and the interpretation of information. Having a theory *ex post* might avoid the biases of a theoretical program while concurrently countering Judge Posner.

Where might a theory for behavioral law and economics come from? Following his critique of BLE, Posner hinted that evolutionary biology can provide valuable explanatory power.[15] Other theorists have since argued the same.[16] In doing so, they stress that "the potential of studying decision making from an evolutionary perspective is that it can provide functional explanations as well as process models of psychological phenomenon."[17] This Note agrees—evolutionary analysis offers a theoretical basis for BLE.

Evolutionary sciences—primarily perspectives from biology and psychology—argue that at least some of the irrationality BLE observes is a product of natural selection.[18] The human brain, the situs of behavior and a creation of natural selection, was formed to deal with the complex decision tasks recurrent in hominid evolution.[19] Accordingly, the brain may never have developed the computational capacity for economic rational choice because our ancestors did not face the kinds of decisions economics demands of us today. As the biologist Steven Pinker notes, "Natural selection . . . did not shape us to earn good grades in science class or to publish in refereed journals. It shaped us to master the local environment, and that led to discrepancies between how we naturally think and what is demanded in the academy."[20] Similarly, natural selection did not shape us to be economic beings.[21]

Evolution then proposes a theory that attempts to predict human behavior, particularly in the areas where economics has failed, by explaining the origins and capacity of human cognition. BLE's studies provide the support for evolution's forecasts. Together they present a new paradigm, evolutionary analysis and the law ("EA"),

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15. Posner, *supra* note 10, at 1561.

16. *See, e.g.*, Owen D. Jones, *Time-Shifted Rationality and the Law of Law's Leverage: Behavioral Economics Meets Behavioral Biology*, 95 NW. U. L. REV. 1141 (2001) [hereinafter Jones, *Time*]. While *Time* specifically addresses biology as a tool for explaining behavioral law and economics, Professor Jones' other articles provide additional insight into the fusion of biology, evolution, and the law. *See, e.g.*, Owen D. Jones, *Law, Emotions, and Behavioral Biology*, 39 JURIMETRICS J. 283 (1999) [hereinafter Jones, *Law, Emotions, and Behavior*]. For a more detailed list of works pertaining to biology, evolution, and the law see Jones, *Time* at 1143 n.7.

17. Rode & Wang, *supra* note 3, at 928; *see also* Jones, *Time*, *supra* note 16, at 1142–45.

18. *See generally* STEVEN PINKER, HOW THE MIND WORKS (1997).

19. *Id.* at 21.

20. *Id.* at 302.

21. "Economic" is used in the modern sense—negotiating preferences and calculating risks in order to produce the most efficient outcome.

which predicts and explains human irrationality through the combination of a motivational theory (evolution) and an empirical study (BLE). The hope is that this new paradigm will, at the very least, bolster rational choice theory.

This Note summarizes and defends evolutionary analysis and the law and suggests that it be used to supplement law and economics. Part I discusses the value of developing a theory to explain BLE's findings. Part II describes evolution's relevance to cognitive shortcomings, provides examples of evolutionary explanations theorists have generated to understand irrational behavior, notes some critiques of EA, and, last, attempts to refute them. Part III discusses the tangible impact that EA can have on the law by providing a better understanding of human behavior.[22]

PART I. WHY DO WE NEED A THEORY?

Before discussing EA in depth, one might question why we need a theory for BLE. If the field produces valid empirical data, shouldn't that be enough? Why should we, like Posner, demand that BLE be theorized? In response, this Note posits that theories are necessary for at least three reasons: (1) theories highlight causes, (2) theories beget theories, and (3) theories facilitate reductionism.

One example of the first justification, theories highlight causes, comes from medicine. Adult males are highly susceptible to prostate tumors.[23] Scientists and physicians now know that high levels of prostate specific antigen (PSA) indicate that "something" is wrong with the prostate.[24] That something may be cancer or it may be any number of conditions. PSA screening does not identify the source of the problem, it just demonstrates that one exists.[25]

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22. This analysis is done through the lens of science. Note that some of the texts referenced are what many consider "popular" science works. One might consider this reliance a flaw. Referencing these materials, however, permits those unfamiliar with science to understand EA. Accessibility is the touchstone.

23. STANLEY ROBBINS ET AL., PATHOLOGICAL BASIS OF DISEASE, POCKET COMPANION 408 (5th ed. Pocket Companion 1995); Ray M. Merrill & Mark K. Morris, *Prevalence-Corrected Prostate Cancer Incidence Rates and Trends*, 155 AM. J. EPIDEMIOLOGY 148, 148 (2002).

24. Howard I. Scher, *Hyperplastic and Malignant Diseases of the Prostrate*, HARRISON'S ONLINE *1, *3 *at* www.harrisononline.com (last modified Aug. 14, 2002).

25. Barnett S. Kramer et al., *Prostate Cancer Screening: What We Know and What We Need to Know*, 119(9) ANNALS INTERNAL MED. 914, 915 (1993) ("The PSA assay is not specific for prostate cancer. Serum levels can be increased with benign disease and are often normal with malignant disease.").

Accordingly, a man with high levels of PSA would not benefit from the test unless the results could be explained. Without a theory as to what causes the reading, physicians have a vague and unhelpful understanding of a patient's ailment. Absent a causal explanation (established here by a biopsy), a doctor could treat a patient for all those conditions that raise PSA levels or make random guesses as to the origin and treat the guesses. This is inefficient and, in the case of medicine, may be just as deadly as failing to treat at all. In contrast, when we have a theory about what causes the readings, we can effectively respond to a condition.

Gravity provides another example.[26] Mariners knew for years prior to Newton's theory of gravity that tides varied relative to the position of the moon. They never knew why, but they readily observed that tides changed. These sailors could have logged tides during various lunar conditions and hoped this running tab would help them predict tides in the future. It is questionable whether or not doing so would have yielded results. What is certain is that when Newton attached a theory to these and other phenomena, we understood why tides changed and could precisely forecast them. By positing a theory, Newton enabled us to master gravity and deal with its challenges rather than just assemble results and hope they lead to something.[27]

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26. This example is from WESLEY C. SALMON, CAUSALITY AND EXPLANATION 129 (1998).

27. *See, e.g.*, BRIAN GREENE, THE ELEGANT UNIVERSE: STRINGS, HIDDEN DIMENSIONS, AND THE QUEST FOR THE ULTIMATE THEORY 57 (1999). Despite Newton's elucidation of gravity, even he was unable to fully explain its cause. As physicist and string-theorist Brian Greene notes:

> "[Newton] gave the world an 'owner's manual' for gravity which delineated how to 'use' it—instructions that physicists, astronomers, and engineers have exploited successfully to plot the course of rockets to the moon ... to predict solar and lunar eclipses; to predict the motion of comets, and so on. But he left the inner workings ... a complete mystery."

Id.

Einstein filled in the Newtonian gaps with his general theory of relativity. Nonetheless, Newton's attempts at explaining the phenomenon of gravity permitted science to take a step up on the ladder of theoretical accuracy and sophistication. *See id.* at 56–62.

Richard Morris adds to the discussion of the value of efforts to explain. He writes, "If scientists did nothing but conduct experiments, our insights into the workings of nature could never have advanced beyond those of the medieval alchemists. It would be impossible to gain an understanding of the nature of the universe ...." RICHARD MORRIS, DISMANTLING THE UNIVERSE 182 (1983). At heart, we want theories because they provide explanations and explanations provide "knowledge of mechanisms of *production* and *propagation* of structure in the world.... [t]hat goes some distance beyond mere recognition of regularities ...." SALMON, *supra* note 26, at 139.

Similarly, while BLE's empiricism is telling, absent a causal explanation of how people act we will not know when and how much the legal regime can shape behavior. As one philosopher of science argued, "[w]e want to explain why bridges collapse to discover how to prevent such occurrences in the future. We want to explain why certain diseases occur in order to find out how to cure them."[28] We also want a theory to explain the findings of BLE because, assuming we normatively desire our society to be one in pursuit of economics' goals, we can learn how to ensure that people act rationally.

The second reason why theories are necessary is that theories beget theories. The history of science demonstrates that one concrete idea leads to another. Creative minds examine posited truths and use the framework of old paradigms to amend aged ideas and generate new ones. The quantum hypothesis, for example, "was originally formulated to explain a puzzle of radiation which had long existed; but in the hands of Einstein it was soon applied to explain the constitution of light and, in the hands of Niels Bohr, to explain the structure of the atom."[29]

We want more theories because, as explained above, theories help us to explain or, said otherwise, to determine causes. This in turn enables us to cure diseases, shore up bridges, and guide human behavior. The more solutions we have for these and other problems, the merrier.

The final reason, that theories facilitate reductionism, proves a bit farfetched in its most absolute form. Strict reductionism aims to deconstruct all sciences into one field.[30] The social sciences fold into biology, biology to chemistry, chemistry to physics, and physics to the ever-elusive general equation or theory.[31] Whether or not the goals of this hard view of reductionism are realizable is not a question for this Note. Nonetheless reductionism, perhaps a softer

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28. SALMON, *supra* note 26, at 80.

29. MAX PLANK, WHERE IS SCIENCE GOING? 178 (1932).

30. *See, e.g.*, STEVEN WEINBERG, DREAMS OF A FINAL THEORY (1992).

31. *See, e.g.*, Paul Oppenheim & Hillary Putnam, *Unity of Science as a Working Hypothesis*, *in* 2 MINNESOTA STUDIES IN THE PHILOSOPHY OF SCIENCE: CONCEPTS, THEORIES, AND THE MIND-BODY PROBLEM 3, 7 (Herbert Feigl et al. eds., 1958).

> It is not absurd to suppose that psychological laws may eventually be explained in terms of the behavior of individual neurons in the brain; that the behavior of individual cells—including neurons—may eventually be explained in terms of their biochemical constitution; and that the behavior of molecules—including the macromolecules that make up living cells—may eventually be explained in terms of atomic physics.

view of it, explains why theories are so important. Take, for example, phenomena that have common causes. Though these occurrences may come from the same place, without a theory we might not be able to recognize the shared ancestry. This inability will in turn lead to inefficient responses to challenges these phenomena propose.

Imagine two legal problems, A and B, which have a common cause. Suppose we know the cause of A and accordingly how to optimally correct for the problem so that it does not threaten our desired scheme. Now, say we come across problem B. We know what it is and what its effects are, but we do not know where it comes from. We could either work backwards to find the roots of B, take random stabs at solving it, or see if B's cause is similar to any other posited explanation. If we recognize that A's theory sufficiently explains where B comes from, we need not go through the discovery process all over again. We can rely on the research previously done about how to deal with A and apply it to B. Both problems, given that they are reduced to a common cause, can be dealt with through one policy.[32] How does this apply to EA? If we can reduce any of the irrational behaviors observed by BLE to the same cause, such as a particular adaptive trait, then we may be able to negate groups of cognitive biases through one policy.

Those who feel a theory is unnecessary might argue that this theoretical and observational specificity counters simplicity. Assuming *arguendo* that BLE and EA do threaten simplicity, note that we will not always defer to them for an explanation. Admittedly, when faced with explaining a particular behavior, law and economics is still the default paradigm because it sufficiently explains a number of phenomena. We have relied on it in the past and should continue to do so in the future. But where law and economics wanes, as in those instances when BLE demonstrates that law and economics' explanations do not fit the facts, we can use EA along with the empiricism of BLE that supports EA theories as an alternative explanatory tool. Under this scheme, we retain the simplicity of law and economics in the majority of situations, but rely on more complicated explanations when the simple ones fail us.

That being said, let us examine how evolution applies to BLE.

Id. at 7.

32. One might say that, if A and B really do have common causes, dealing with A would have resolved B in the first place. This is true, but in reality causes may not be identical but very similar.

PART II. THE ROOTS OF AN EVOLUTIONARY EXPLANATION

With all the concepts that science offers, why is it that evolution provides a promising explanation for cognitive shortcomings and irrational behavior? The answer lies in the brain. BLE scholars have noted that cognitive biases originate, among other things, from bounded rationality.[33] Formulated by Herbert Simon, "[b]ounded rationality essentially captures the idea that there are very real, very important constraints on the actual human capacity to gather and process information."[34] For example, the brain, like a computer, has speed and memory limits.[35] Because the brain cannot perform an infinite number of computations in a finite time, people cannot evaluate probabilities and assess risk in the manner that expected utility demands.

Beyond this, the brain is bounded by another computational limit. The brain performs algorithms—functions aimed at solving problems. Unfortunately, the brain can only perform a limited number of algorithms because, aside from the hardware limits of speed and memory, the brain is constrained by its internal programming or its software. It can only conduct certain tasks because it has only been coded to do particular things.[36]

Where do these programs come from? The biologist's answer is genetics. Genes, just like for an arm or a nose or (more aptly because it possesses its own program) embryonic development,[37] provide the schematics and commands that "form" the brain. These genes code a programming selected for during evolution. Essentially, "[t]he mind is a system of organs of computation, designed by natural selection to solve the kinds of problems our ancestors faced in their foraging way of life."[38] Consequently, it contains only those algorithms necessary to solve problems humans and their genetic predecessors faced during the period of

33. Jolls et al., *supra* note 4, at 14.

34. Jones, *Time, supra* note 16, at 1150.

35. *See, e.g.*, FRANK TIPPLER, THE PHYSICS OF IMMORTALITY 23 (1994). As an interesting aside, some have attempted to define the limits of the brain's computational speed and storage capacity. Frank Tippler estimates that the brain can store 1015 bits and runs at a max of 10 teraflops (calculations per second). Today's fastest computers can match the brain's storage capacity but clock in at "slow" 200 gigaflops. If, however, the rate at which processing speed has grown remains constant, man made computers should become as fast as the brain in less than a decade. *Id.*

36. *See generally* PINKER, *supra* note 18, at 21.

37. MATT RIDLEY, GENOME: THE AUTOBIOGRAPHY OF A SPECIES IN 23 CHAPTERS 106 (1999).

38. PINKER, *supra* note 18, at 21.

human physiological evolution.[39] As a result, the brain is often unable to perform those calculations that do not correspond to a preexisting algorithm.[40] When given a novel input, the brain will try to process it via an established algorithm. This attempt may lead to a "correct" answer in some instances but the "wrong" one in others. Some of what BLE observes as irrational behavior are likely the results of those flawed responses.[41]

Evolution, then, is a good theoretical basis for cognitive shortcomings because it, through the engine of natural selection, formed the brain responsible for BLE's empirical data. This becomes clear when we realize that the algorithms our brain is programmed to conduct result in behavior.[42] Here, behavior is broadly defined to include any response, physical or mental, the body has to a stimulus that the brain (or its physiological analogs like reflex loops) processes. In light of this, "all theories about behavior are ultimately theories about the human brain . . . [f]or our actions inevitably reflect the brain's information processing patterns, which in turn reflect its form and function."[43] Stated otherwise, "[b]rain function reflects the evolutionary processes that built the brain's intricate functionality. Therefore, behavior—the principal output of the brain—reflects evolutionary processes."[44]

This hypothesis can be explained in another way. A number of evolutionary biologists argue "[t]he ultimate goal that the mind [the programming of the brain] was designed to attain is maximizing the number of copies of the genes that created it."[45] Efficient brains helped ensure that animals propagate their genes by endowing an organism with those faculties it needed to stay alive in the environment of evolutionary adaptation ("EEA"). A simple example is motor control.[46] The brain can, thankfully, process a stimulus and effect muscular contractions at a high speed. This endowment is particularly important when attacked. The brain quickly evaluates a situation and commands us to run or fight, thus we have a better chance of staying alive. The same could be said of hunting. The brain notes a prey and summarily directs our muscles to attack. Because of this faculty, our hunter-gatherer ancestors not

39. *Id.*
40. Jones, *Time, supra* note 16, at 1164–74.
41. *Id.*
42. PINKER, *supra* note 18, at 25, 27.
43. Jones, *Time, supra* note 16, at 1143.
44. *Id.* at 1165.
45. PINKER, *supra* note 18, at 43. *See generally* RICHARD DAWKINS, THE SELFISH GENE (1976).
46. DAWKINS, *supra* note 45, at 52.

only made it home at the end of the day, but put food on the table, too.

The key is to recognize that those brains that possessed algorithms capable of responding to selective pressures during human evolution are those that brains possess today, because they facilitated gene replication via reproduction.[47] Unfortunately these same adaptations once necessary for survival do not always serve us as optimally in the modern environment. Steven Pinker notes why:

> For ninety-nine percent of human existence, people lived as foragers in small nomadic bands. Our brains are adapted to that long-vanished way of life, not to brand-new agricultural and industrial civilizations. . . . Our ancestral environment lacked the institutions that now entice us to nonadaptive choices . . . .[48]

For these reasons, while the motor skills humans developed in the past are demonstrably still beneficial, some adaptations, like a brain only capable of processing natural numbers (as noted below), do not serve us well today.

A. Explaining Cognitive Biases and Heuristics

Because adaptations to past environments formed the brain, we can see how our cognitive processes might not satisfy today's thought requirements. Where the modern environment mirrors that of the EEA, our brain may be fit to deal with a number of the challenges of the past and of today. It is less able to deal, however, with those current conditions that differ from the EEA.

Aside from traits maladapted to the modern environment or the absence of algorithms that could never be selected for, the brain is limited because the adaptations it does have do not embody the best faculties.[49] The reason why the human body is not ideal is that

47. PINKER, *supra* note 18, at 21 ("[The brain's programming] was shaped by natural selection to solve the problems of the hunting and gathering life led by our ancestors in most of our evolutionary history. The various problems for our ancestors were subtasks of one big problem for their genes, maximizing the number of copies that made it into the next generation.").

48. *Id.* at 42.

49. HENRY PLOTKIN, EVOLUTION IN MIND: AN INTRODUCTION TO EVOLUTIONARY PSYCHOLOGY 12–13 (1998) ("Most adaptations . . . are not nearly perfect—indeed some are

imperfect adaptations provided enough fitness for us to get by and reproduce. Our brain is a bounded computer because our genes did not need a limitless supercomputer to replicate and propagate. Far from perfection, the human body does the best it can with the tools natural selection endowed.

Human optics provides a good example of an imperfect adaptation.[50] When someone creates a television image for us to see, they take an object and convert it into a retinal image that our eye observes as input. In order for us to then see the image, essentially two things happen. First, our eyes attain the retinal projection, and, second, the brain converts this retinal image into a visual one. Sounds simple enough. The problem is that seeing (as opposed to creating the image) is an inverse optics problem. While in producing an image, we reduce a visual to a permutation of colors, in seeing, the brain has to somehow turn a permutation into an image. Picture the similar problem with multiplication. "[I]t is easy to multiply some numbers and announce the product, but impossible to take a product and announce the numbers that were multiplied to get it . . . ."[51]

How then does the brain take a random assortment of colors on a television screen and convert it into an image? "The answer is that *the brain supplies the missing information,* information about the world we evolved in and how it reflects light. If the visual brain 'assumes' that it is living in a certain kind of world . . . it can make good guesses about what is out there."[52] In our math problem, it would be as if we had a product, wanted to find out the multipliers, and knew that only prime numbers could be factored in our world. We would decipher that 339 is the product of 3 and 113. The same is true with vision. If we know that the world consists of certain colors and shapes, we can probably make guesses as to what made the retinal image.

The brain's ability to see is not as straightforward as it could be. We could just "see" what we see instead of converting an image with the help of our perceptive heuristic. Moreover, because the brain relies on an assumption it developed during the EEA, when an input does not represent something that fits within our understanding of how light reflects off objects or depth perception, we may not perceive it.[53] That is why we have a hard time seeing in

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quite a long way from perfection, and a competent engineer would have designed something much more suitable.").

50. This example is taken from PINKER, *supra* note 18, at 28.

51. *Id.*

52. *Id.*

53. *Id.* at 29.

multiple dimensions. The mathematics allegory would be living in a world using prime numbers and then trying to figure out which primes multiply out to 1000.

As in the optics example, many of our cognitive processes are rooted in an imperfect evolutionary adaptation that cannot negotiate novel and unfamiliar tasks. The remainder do not embody "rational" thought because these algorithms could never be selected for. This history explains what today appear as cognitive biases. To better understand these limitations, "we need to look at the structure of the environment and the types of tasks that humans have faced throughout their history of evolution"[54] and compare them against the tasks we are faced with today. Where the environment and tasks between the two eras have diverged, the tools with which natural selection endowed us may preclude behavior that is rational in the purest economic sense. And where, as with the optics example, an adaptation that is actually beneficial and selected for in the EEA has limits, these bounds persist today. Below are three evolutionary explanations to cognitive shortcomings that utilize this analysis.

1. Owen Jones and Time-Shifted Rationality—Professor Owen Jones believes in the promise of evolutionary analysis and the law.[55] Jones, in contrast to BLE scholars and economics, refuses to characterize human behavior that is inconsistent with economic theory as irrational.[56] Instead, he argues that some of the behavior viewed as irrational today was very rational during the EEA. The only reason that the behavior observed by BLE seems "wrong" is that humans are responding to stimulus in the manner they would have during the EEA. In this sense, some cognitive biases are likely the result of evolutionary adaptations that were once *rational* but are *maladapted* to today's challenges.[57]

The "temporal mismatch of historically adaptive behavior and modern environments" is what Jones terms "time-shifted rationality."[58] Specifically, time-shifted rationality describes "any trait

54. Rode & Wang, *supra* note 3, at 928.

55. Jones, *Time*, *supra* note 16; *see also* Owen D. Jones, *Evolutionary Analysis in the Law: An Introduction and Application to Child Abuse*, 75 N.C. L. REV. 1117 (1997) [hereinafter Jones, *Child Abuse*].

56. Jones means "irrational" in the sense commonly used by traditional economics, i.e., making choices that do not conform with expected utility theory or the rational actor model. *See* Jones, *Time*, *supra* note 16, at 1141.

57. *See also* KEITH E. STANOVICH, WHO IS RATIONAL?: STUDIES OF INDIVIDUAL DIFFERENCES IN REASONING 148–52 (1999) (detailing prior literature that discusses the distinction between evolutionary rationality and normative rationality).

58. Jones, *Time*, *supra* note 16, at 1172.

resulting from the operation of evolutionary processes on brains that, while increasing the probability of behavior that was adaptive in the [EEA], leads to substantively irrational or maladaptive behavior in the present environment."[59] Using time-shifted rationality as his lens, Jones examines a number of cognitive biases to show that they might be products of behavior that improved fitness during natural selection. He notes, for example, that the inconsistent preferences exhibited by a dieter who eats ice cream reflect an evolution-driven proclivity to high caloric foods.[60] In doing so, he demonstrates that inconsistent preferences may arise when an evolutionary tendency, a preference for calories, conflicts with modern environmental factors—the overabundance of high caloric foods.

One of Jones' more plausible evolutionary arguments comes from his discussion of over-cooperativeness.[61] Why, for example, do people leave tips when they travel on the road? Jones proffers that such behavior results from the adaptiveness of reciprocal altruism.[62] During the EEA humans lived in small communities. In those groupings, each member relied on one another such that each individual knew if she scratched someone's back, he would later do the same for her. Jones contends that this behavior is predisposed because those who practiced reciprocal altruism were best fit to survive during selection.[63] The "reciprocal altruism gene" passed on to modern times and is still active. We still scratch others' backs because the forces that formed our brains compel us to believe they will do the same for us despite the fact that reciprocity is unlikely in today's expansive communities.

Jones also explains that some behavior that goes against expected utility theory occurs because there was never an opportunity in hominid evolution for the "rational" behavior to be selected for.[64] Perhaps it is best to properly discount futures, but how would hunter-gatherers ever have to consistently consider the value of goods months or years ahead of time? During the EEA the only apparent goods were likely foodstuffs and land. Land was not scarce so our ancestors did not have to be concerned about toiling

59. *Id.*

60. *Id.* at 1175.

61. *Id.* at 1176.

62. Reciprocal altruism involves "symbiotic relationships of mutual benefit." DAWKINS, *supra* note 45, at 196. Stated otherwise, reciprocal altruism embodies the principle of "You scratch my back, I'll scratch yours." *Id.* at 179. For more on reciprocal altruism, see, for example, *id.* at 196–202; Robert L. Trivers, *The Evolution of Reciprocal Altruism*, 46 Q. REV. BIOLOGY 35 (1971).

63. Jones, *Time*, *supra* note 16, at 1176–77.

64. *Id.* at 1166, 1174–75.

a field to the point of future infertility. Meat could not be held onto for later times because it would spoil without curing or refrigeration. Efficiently considering future costs was not necessary because limited resources or the tragedy of the commons never presented a challenge.[65] As a result, conditions never selected for a brain with the capacity to discount futures.

Jones' propositions are compelling but imprecise. He speaks in generalities and does not explain all cognitive biases. He, however, does not see this as a flaw. From his perspective "the examples were intended first to suggest the general contours of how a time-shifted rationality analysis might proceed and, second, to provide a sufficient sense of plausibility to warrant further future exploration."[66] Jones clearly accomplishes both of these tasks. Others who likely support Jones' propositions proffer more concrete evidence of the evolutionary basis for cognitive errors. Two examples are discussed below.

2. *Rode and Wang: Risk-Sensitive Foraging Theory and Cognitive Biases*—As one might expect, the ability to obtain sufficient nutrition embodies a particularly salient example of fitness. Relying on this assumption, Catrin Rode and X.T. Wang argue that the ambiguity effect and the framing effect can be explained as modern manifestations of adaptive thinking that aided our ancestors to find food.[67]

"The ambiguity effect occurs when people choose an option for which the probability information is explicitly stated over one for which it is either imprecise or lacking, even though both have the same expected utility."[68] The traditional example of this is when subjects are asked whether they want to select a ball from a box containing 50 black balls and 50 white balls or containing 100 black and white balls in an unknown composition when they know they will get money for choosing a black ball.[69] Although the payoff for both under expected utility theory is the same, people prefer to select from the 50/50 box.

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65. For further discussion on this point, see E. Donald Elliot, *The Tragedy of the Commons: Evolutionary Biology, Economics and Environmental Law*, 20 VA. ENVTL. L.J. 17, 22 (2001) ("[W]hen human populations are small and environmental resources are plentiful, a 'frontier mentality' typically develops that shows little or no concern for preserving natural resources and managing the environment.").

66. Jones, *Time, supra* note 16, at 1185.

67. Rode & Wang, *supra* note 3.

68. *Id.* at 927.

69. *See id.* at 929 (summarizing the works of Camerer & Weber and Curley, Yates, & Abrams).

Rode and Wang explain that this choice results from a particular algorithm that would have been adaptive during the EEA.[70] This mental process has been termed by others as "risk-sensitive foraging theory."[71] Rode and Wang ask us to imagine an animal that needs 250 calories and who can forage in one of two patches. Each of these patches has the same expected payoff of 250 calories, but differ in the variability of expected payoff. One, by analogy, is the 50/50 box while the other is the "unknown" box. Risk-foraging theory predicts that an animal would seek food in the 50/50 patch because it will "more likely" offer the 250 calories. While the high variance patch may provide less than a 50/50 chance to get 250 calories, under expected utility theory, it would not offer greater than a 50 percent chance. Animals will tend to go where they will get the food they need. The brain that coded for this response likely propagated via natural selection.

Altering the caloric requirement supports this hypothesis.[72] If an animal could seek food in the same patches discussed above but needs 300 calories, where would it go? Since 250 calories are no longer enough, the 50/50 patch will not do because a one-in-two chance at getting 250 calories is insufficient to satisfy the 300-calorie minimum. In theory, a forager would choose the ambiguous, high-variance patch because there it may be possible, no matter how unlikely, to get 300 calories.

Rode and Wang demonstrated this effect empirically by playing the ball game with varying minimum requirements.[73] Subjects had to select ten balls from either box. "[P]articipants preferred the high-variability ambiguous option when the required number of black balls exceeded the expected number of black balls of the low-variability option . . . and they selected the low-variance option when the minimum requirement was below the expected number."[74]

This application of risk-foraging theory to the ambiguity effect shows that humans consider the expected payoff of variable options, the variability of possible outcomes, and current need when making choices. Thus, the ambiguity effect is not a cognitive bias.[75] Instead it is a sensible algorithm that enabled adequate nutrition

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70. *Id.* at 929–31.

71. *See, e.g.*, DAVID W. STEPHENS & JOHN R. KREBS, FORAGING THEORY 128–150 (1986).

72. Rode & Wang, *supra* note 3, at 930.

73. *Id.* at 930–31. This study is reported in full in C. Rode et al., *When and Why Do People Avoid Unknown Probabilities in Decisions Under Uncertainty?: Testing Some Theories from Optimal Foraging Theory*, 72 COGNITION 269 (1999).

74. Rode & Wang, *supra* note 3, at 931.

75. *Id.* at 928.

during the EEA.[76] This faculty continues to express itself today; unfortunately, for economists, this behavior disturbs their forecasts.

Rode and Wang also provide an evolutionary explanation for the framing effect.[77] Kahneman and Tversky used the Asian disease problem to demonstrate that people's preferences varied based on how outcomes were phrased.[78] In this problem, subjects were asked to choose between two responses to a disease outbreak that infected 600 people: Plan A would save a third of the infected for certain, while instituting plan B would provide a one-third chance that all would survive and a two-thirds probability that all would die. A majority of subjects chose plan A. Others had to select from outcomes framed in terms of death: Plan A would kill two-thirds for sure while under Plan B there was a one-third probability that no one would die and a two-thirds chance they all would die. Here, respondents preferred plan B.

Rode and Wang (based on Wang's previous research)[79] noted that the framing effect was context dependent on the number of people infected.[80] Wang repeated the Asian disease experiments but varied the number of infected to 6000, 600, 60 and 6. He discovered that preferences were inconsistent in the 6000 and 600 hypotheticals but not in the 60 and 6 problems. In the smaller group sizes, the participants consistently chose the unknown outcomes (Plan B solutions) regardless of how the alternatives were framed. The most consistent choices came when the group of six was identified as kin.

Why the indirect correlation between uniformity and the number infected? Rode and Wang rely on society size during the EEA to provide an answer. Humans lived in small groups of roughly twenty-five kin in the EEA. "[The framing effect] only occurred in the evolutionary novel large-group contexts but disappeared in evolutionary typical small-group contexts. These findings suggest that people pay more attention to verbal cues . . . when ecologically more valid decision cues are absent."[81]

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76. *Id.* at 931.

77. *Id.* at 931–35. The framing effect demonstrates a reversal in risk preference dependant upon how choices are phrased. *See generally* Daniel Kahneman & Amos Tversky, *The Framing of Decisions and the Psychology of Choice*, 211 SCIENCE 453 (1981).

78. Kahneman & Tversky, *supra* note 77, at 453.

79. X.T. Wang & V. Johnston, *Perceived Social Context and Risk Preference: A Reexamination of Framing Effects in a Life-Death Decision Problem*, 8 J. BEHAV. DECISION MAKING 279 (1995).

80. Rode & Wang, *supra* note 3, at 933.

81. *Id.*

This is consonant with microevolution. Selfish gene theory notes that evolution involves the survival of genes.[82] This result can be achieved not only in saving yourself to ensure your genes propagate through reproduction, but also in protecting your kin who possess a certain percentage of genes in common with you that they can pass on.[83] If kin survive and reproduce, they too will pass on "your" genes.[84] Accordingly, the goal is to enable the greatest number of kin to live. In hominid societies, it was likely necessary that for the greatest number of kin to survive a critical mass always had to be alive. (This is because survival often depended on common defense or delegation of work, i.e., hunting versus raising children.) This resonates with risk-sensitive foraging theory. Having a critical mass likely improves access to food. As a result, a live-or-die mentality developed.

This explains the consistent choices in the smaller-group context Asian disease problem. In the past, nature selected for those brains with an algorithm that either understood problems possible in the EEA, or took risks to keep the population above the critical mass. We still possess that hard-wiring today, so it affects our choices and generates the behavior that BLE observes.

3. The Base-Rate Fallacy and Natural Numbers[85]—The last evolutionary explanation of a cognitive bias this paper discusses is likely the most well-known. The base-rate fallacy asserts that people cannot calculate probabilities correctly. This cognitive flaw no doubt strikes at the core of economics because a rational actor needs to assess probabilities to comprehend expected utilities.

The study frequently cited to demonstrate the base-rate fallacy is Casscells' survey of Harvard Medical School doctors and fourth-year students.[86] In this experiment, subjects were asked to calculate the rate of false positives for a medical test when background information was presented as percentages. Under these conditions, only eighteen percent came up with the correct Bayesian answer.

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82. *See generally* DAWKINS, *supra* note 45, at 13–21.

83. *Id.* at 95-116.

84. *Id.* at 101. This is termed kin-selection.

85. This discussion draws from GERD GIGERENZER, ADAPTIVE THINKING 57–125 (2000) and Leda Cosmides & John Tooby, *Are Humans Good Intuitive Statisticians After All? Rethinking Some Conclusions from the Literature on Judgment Under Uncertainty*, 58 COGNITION 1 (1996). Note, however, the distinction between Jones, Rode & Wang, and Gigerenzer. The first two describe how behavior deemed today as irrational actually developed because of a divergence between evolutionary shaped behavior and modern environments. The latter discusses how choices and decision-making processes that seem irrational really are not errors at all.

86. Ward Casscells et al., *Interpretation by Physicians of Clinical Laboratory Results*, 299 NEW ENG. J. MED. 999 (1978).

Based on this study some have asserted that the human brain has a cognitive incapacity to calculate probabilities. Gigerenzer as well as Cosmides and Tooby, however, independently showed that the brain is completely able to conduct Bayesian calculations.[87] Each rehashed Casscells' study but instead proffered information in frequencies. Both found that when presented with background information in natural numbers, humans calculated the Bayesian answer.[88]

The natural number studies explained the difference in outcome from an evolutionary perspective. Cosmides and Tooby do so succinctly:

> Reliable numerical statements about single event probabilities were rare or nonexistent in the Pleistocene. . . . In our natural environment, the only database available from which one could inductively reason was one's own observations. . . . No organism can evolve cognitive mechanisms designed to reason about, or receive as input, information in a format that did not regularly exist.[89]

Because humans did not encounter probabilities in nature, pressure in the EEA could not have selected for a brain that processed probabilities. On the other hand, humans often came across frequencies. Frequencies, after all, are a product of everyday observations. This reality explains the base-rate fallacy through the insight of evolution.

B. The Value of Explaining BLE's Findings

The examples from the previous section all take stabs at applying the theory of evolution to explain the findings of behavioral studies. This Note already spoke of the value in theorizing the observations of behavioral economics and behavioral law and economics. Theories, as noted above, can identify causes and accordingly generate possible solutions. In the history of science, theories led to the creation of other ideas. And finally, theories help to reduce seemingly independent observations to a single origin.

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87. GIGERENZER, *supra* note 85; Cosmides & Tooby, *supra* note 85.
88. GIGERENZER, *supra* note 85; Cosmides & Tooby, *supra* note 85.
89. Cosmides & Tooby, *supra* note 85, at 15.

The value of identifying causes cannot be overstated. As discussed earlier, absent a theory, BLE is a catalogue of observations. While this list may aid us to predict what may happen in those situations previously observed, BLE on its own cannot tell us what will occur in novel circumstances. "Empirical observation alone could serve as the basis for predicting behavior only if every possible future situation could be observed *ex ante* either in the real world or in a laboratory."[90] Professor Russell Korobkin provides a brief example. Say we observe a man found guilty and punished for stealing an apple.[91] What will happen when someone steals an orange? We can make no prediction based on the first observation because we do not know if the court is punishing stealing or the possession of apples. Only when we decipher the court's motivation—the cause for the conviction—can we hypothesize about the implications of the orange theft.

There is other value in explaining the root of cognitive biases. Clearly, the main goal of evolutionary analysis and the law would be the same one the legal system holds today—to generate rules effective at guiding behavior. Note that when we form legal rules we operate with base assumptions of how humans act. But "if we premise legal policy on the assumption that people behave rationally, and if their behavior too systematically proves otherwise, then the desired results of our legal rules may not follow."[92] In order to properly direct behavior we need to know in which ways we need to manipulate it. If we know that people are not rational, as EA and BLE together demonstrate, we know that our legal regimes should not favor rules that presume human rationality.

The evolutionary roots of irrationality can also offer insight as to whether we can correct biases. As Thomas Ulen points out, "I hope that [BLE] will soon address . . . the distinction between ingrained cognitive limitations and those that are not hard-wired into us and are therefore subject to behavioral modification. . . . If natural selection has hard-wired our brains for a particular cognitive limitation . . . then we probably cannot fully escape those limitations."[93] This idea resonates with our discussion of human sight.[94] Recall the assumptions the brain makes when we see. This capacity is surely hard-wired. As a result, the "cheat-sheet is so deeply

90. Russell Korobkin, *A Multi-Disciplinary Approach to Legal Scholarship: Economics, Behavioral Economics, and Evolutionary Psychology*, 41 JURIMETRICS J. 319, 328 (2001).

91. *Id.* at 327–28.

92. Jones, *Time, supra* note 16, at 1153.

93. Thomas Ulen, *The Growing Pains of Behavioral Law and Economics*, 51 VAND. L. REV. 1747, 1760 (1998).

94. *See supra* notes 50–53 and accompanying text.

imbedded in the operation of our visual brain that we cannot erase the assumptions written on it."[95] In recognizing this, when we want someone to see in another dimension, we do not work against the hard-wiring. Instead, we try and work with or around it. If EA can define the bounds of hard-wired behavior, we will either realize that they are inevitable or we can devise legal correctives that, by circumventing our brain's program, may properly respond to irrationality.[96]

Identifying causes more centrally challenges our ability to unlearn cognitive shortcomings because "learning is not a surrounding gas or force field, and it does not happen by magic. It is made possible by innate machinery designed to do the learning."[97] Information on what limitations evolution imposes on the brain also highlights how and what we can learn. Where a bias cannot be deprogrammed with education that operates within the brain's bounds, it will persist.

C. Critiques of Evolutionary Analysis

A wave of criticism attempts to discredit the predictive power and value of EA. By and large they reduce to one argument: EA is not a true science because its predictions can never be proved or discredited.[98] This line of argument recasts the responses to sociobiology posited in the 1970s.[99] Today, these criticisms mainly come from cognitive psychologists and biologists.

BLE's Jeffrey Rachlinski criticizes EA.[100] He notes that evolutionary analysis and the law can never be complete because we do not know enough about the EEA.[101] The fossil record is too sparse and does not contain any information on behavior or our

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95. PINKER, *supra* note 18, at 29.

96. Jones describes our ability to correct an irrational adaptation with his "law of law's leverage." Jones, *Time*, *supra* note 16, at 1190. This principle states, "The magnitude of legal intervention necessary to reduce or to increase the incidence of any human behavior will correlate positively or negatively, respectively, with the extent to which a predisposition contributing to that behavior was adaptive for its bearers, on average in past environments." *Id.*

97. PINKER, *supra* note 18, at 33.

98. *See, e.g.*, Jeffrey J. Rachlinski, Comment, *Is Evolutionary Analysis of Law Science or Storytelling*, 41 JURIMETRICS J. 365 (2001).

99. Gould's responses to E.O. Wilson were the most evident of these. *See, e.g.*, Steven J. Gould, *Sociobiology: The Art of Storytelling*, NEW SCIENTIST, Nov. 16, 1978, at 530.

100. Rachlinski, *supra* note 98.

101. *Id.* at 366–67.

ancestral environment. Absent this knowledge, evolutionary scientists cannot reasonably decipher what cognitive processes and behavior could be selected for. In light of this ambiguity, evolutionary explanations can never be tested and are, therefore, unscientific.[102] Rachlinski further asserts that the allure to EA lies in its "scientific pedigree" because EA's "close connection to biology lends it the gloss of empiricism and theoretical rigor that the hard sciences enjoy."[103]

Richard Lewontin, a distinguished biologist and critic of sociobiology, shares Rachlinski's views on evolutionary explanations.[104] Although he never replied to EA directly, his writings evidence his beliefs. Lewontin writes, "whole books have been written making claims about the actual course of human cognitive evolution. . . .[s]ome of these speculations might be true, but we don't know . . . how we would go about finding out."[105] He reasons so because "[d]espite the existence of a vast and highly developed mathematical theory of evolutionary processes in general, despite the abundance of knowledge about living and fossil primates, despite the intimate knowledge that we have of our own [species], we know essentially nothing about the evolution of our cognitive capabilities . . . ."[106] Stephen J. Gould agrees and terms most all evolutionary explanations for human cognition "just-so stories."[107]

Russell Korobkin adds to the critique. He points out that the imprecision of evolutionary arguments is indicative of any motivational theory.[108] All motivational explanations are driven by their underlying hypothesis.[109] If X represents the theory, "[f]rom that postulate, one can deduce predictions about how individuals will behave in a variety of contexts: because their goal is X, people will take the necessary steps to achieve X . . . ."[110] Korobkin argues that this method has two faults: motivational theories (1) can predict

102. *Id.* at 366.

103. *Id.*

104. Lewontin's views, along with Wilson's, are discussed in detail in ULLICA SEGERSTRÅLE, DEFENDERS OF THE TRUTH: THE BATTLE FOR SCIENCE IN THE SOCIOBIOLOGY DEBATE AND BEYOND 35–53 (2000).

105. Richard C. Lewontin, *The Evolution of Cognition: Questions We Will Never Answer*, *in* 4 AN INVITATION TO COGNITIVE SCIENCES: METHODS, MODELS, AND CONCEPTUAL ISSUES 107, 108 (Don Scarborough & Saul Steinberg eds., 1995).

106. *Id.* at 108–09.

107. Stephen J. Gould, *Sociobiology and Human Nature*, *in* SOCIOBIOLOGY EXAMINED 288 (Ashley Montagu ed., 1980).

108. Korobkin, *supra* note 90, at 321.

109. *See supra* note 14 and accompanying text.

110. Korobkin, *supra* note 90, at 320.

multiple and opposing behaviors and (2) those predictions it does make are incorrect.[111]

Another critical assessment of evolutionary explanations posits that even if a complete fossil record were found, the elaborations in culture make it impossible to score adaptation to the EEA with modern behavior.[112] "[Culture has] increased the 'distance' between our primate heritages and our life; [cultural developments] seem to have countermanded our primate heritage, as with tolerance to homosexuality, voluntary or mandated birth control, or the popularity of risky thrill-seeking activities."[113] This space confounds any explanation because the relationship between today's behavior, as generated by cultural practices, and biology may not exist. This fact, when coupled with the incomplete evidence and limited empirical testing, forces a number of theorists to discount EA all together. They contend it is an abstract and unfounded exercise that cannot be concretely supported.

D. Responses to the Criticism

While on their face the criticisms of evolutionary analysis seem valid, they eventually fail for three reasons. First, they undervalue unproven scientific explanations. Second, these criticisms ignore that a responsible scientific method can ensure EA's statements are neither Gould's "just-so stories" nor, as Korobkin holds, internally inconsistent. And finally, they discount that scientific advancements are generating new tools that provide a better evidentiary foundation for evolutionary analysis.

Rachlinski, in focusing on the lack of evidence to support EA, misunderstands the nature of science.[114] True, by and large, scientific explanations have concrete evidence. That is, after all, what many scientists will argue distinguishes science from philosophy and religion. Even assuming *arguendo* that EA is short on evidence, Rachlinski ignores that "even unproved theory can be useful in analyzing legal issues."[115] In fact, the cathedral of science houses a number of theories widely accepted as either truth or of essential

111. *Id.* at 321.

112. Paul Rozin, *Evolution and Adaption in the Understanding of Behavior, Culture, and the Mind*, 43 AM. BEHAV. SCIENTIST 970, 976 (2000).

113. *Id.*

114. *See supra* notes 98–103 and accompanying text.

115. Jeffrey Evans Stake, Comment, *Can Evolutionary Science Contribute to Discussions of Law?*, 41 JURIMETRICS J. 379, 380 (2001).

value that are supported by what Rachlinski, Lewontin, and Gould would consider untenable or incomplete proof.

An example comes from studies of the origin of the universe. Astrophysics and cosmology use the behavior and constitution of particles to form theories of the big bang, black holes, and the life cycles of celestial bodies. A vast number of tools essentially compile archaeological data of light and other forms of energy radiated billions of years ago. This evidence is coupled with the nature of particles today to prospect on a number of principles.

Despite all of this, do we really know anything about the environment in which the universe formed or that the laws of physics remained constant throughout time? Our knowledge of this state is even less than that of our environment's past. Nonetheless, astrophysicists that most all revere are rarely discredited as "just-so-ists". In fact, many consider their ruminations some of the most intellectually commendable in modern science.

The philosopher and physicist Richard Morris makes broader sense of the nature of science when he wonders how to distinguish between science and just-so stories.[116] Among other things, Morris asserts, "[t]he difference between scientific and crackpot theories does not have much to do with experimental confirmation. . . . There have been many scientific theories which could not be subjected to experimental tests until years or decades had passed."[117] He cites Newton's law of gravity and Einstein's theories of relativity as two prominent examples.[118]

The same could be said of EA. While it seems strange to parallel evolutionary explanation to Newton's and Einstein's fundamental theories, the analogy makes it clear that what Rachlinski perceives in EA as a lack of evidentiary support hardly obviates it as an intellectually commanding force. If we really hope to discredit EA, we have to prove it untrue by uprooting its assumptions or specifically disproving its theories, not by broadly asserting there is nothing to it. This statement takes note that "[t]he boldness of asking deep questions may require unforeseen flexibility if we are to accept the answers."[119] This flexibility may include a tempered skepticism and an opportunity to investigate a theory before a speedy rejection.

Korobkin's criticism, as well as that of those who fear "just-so stories," can be addressed by ensuring that a defined scientific

116. *See* MORRIS, *supra* note 27, at 138–39.

117. *Id.* at 139.

118. *Id.*

119. GREENE, *supra* note 27, at 108.

method is used in evolutionary analysis. Doing so can weed out unlikely explanations. Steven Pinker articulates one such method.

> A good adaptationist explanation needs the fulcrum of an engineering analysis that is independent of the part of the mind we are trying to explain. The analysis begins with a goal to be attained and a world of causes and effects in which to attain it, and goes on to specify what kinds of designs are better suited to attain it than others . . . .
>
> Once we have a spec sheet for a well-designed mind, we can see whether *Homo sapiens* has that kind of mind. We do the experiments . . . to get the facts down about a mental faculty, and then see whether the faculty meets the specs: whether it shows signs of precision, complexity, efficiency, reliability, and specialization in solving its assigned problem . . . .[120]

It is the same method of reverse engineering that we use in other fields. Pinker shows how this method has been successfully used.[121]

Essentially, a method that supports precision defends those explanations that find a complex adaptation where an intuitively good fit between the trait and the environment exists, and powerful and pervasive selection pressures for the trait were present. Consequently, we can discredit those explanations that violate this rule. It is silly, for example, to say that the evolutionary basis for why men do not ask for directions is that in the past approaching a stranger or showing poor confidence would have ended in death.

Finally, those critics who chide EA for a lack of evidence ignore that support for a theory can come after its exposition. It is clear that as science progresses, evolutionary scientists attain better tools and facts with which to explain or prove their hypotheses. For example, the deciphering of the genome will no doubt lead to a better understanding of evolution. As Matt Ridley prospects:

> [R]ound and round the theories we go in a spiral of comforting justification, proving how we came to be as we are. We have built a scientific house of cards on the flimsiest foundations of evidence, but we have reason to believe that it will one day be testable. The fossil record will tell us only a little

120. PINKER, *supra* note 18, at 38.

121. Cosmides & Tooby used a similar method in their study on the evolutionary basis for the base-rate fallacy. Cosmides & Tooby, *supra* note 85, at 14.

> about behaviour; the bones are too dry and random to speak. But the genetic record will tell us more.[122]

Additionally, while useful in and of itself, understanding the human genome will lead to other information, such as phylogenetic evidence,[123] that will aid evolutionary researchers.[124]

The value of unproven theories, the use of a refined scientific method, and the promise of new discoveries all oppose an early discarding of EA. Evolutionary explanations as they stand may very well posit a number of untenable hypotheses, but a responsible and more advanced approach will render EA a consistently valid predictor of behavior.

PART III: EA IN ACTION

EA aids in the formulation and application of law and regulating schemes. Law, as noted above, seeks to guide behavior. To be able to monitor and direct how people act, law and policy makers need to understand what motivates individual decisions. Law and economics, with its focus on incentives, elucidates this phenomenon. It carefully analyzes how people will react to regulations. Where the response is favorable, law and economics supports the legal policy.

The problem with law and economics is that it incorrectly predicts how people will behave. Given this inadequacy, its utility is limited because those policies the economic model supports are falsely grounded. Stated otherwise, "[e]very legal regime has, as its fulcrum, a behavioral model that purports to describe causal influences on law-relevant behavior."[125] Deductively, "[t]he law can obtain no more leverage on that behavior than the solidity of that behavioral model affords."[126] Where the law presumes that a behavior is the result of a causal mechanism which is inaccurate (e.g., traditional cost-benefit analysis) or makes false assumptions of how people will act (e.g., negotiate a right away given what economics considers sufficient compensation), its ability to moderate behavior will wane. As noted above, EA can help by identifying probable

122. RIDLEY, *supra* note 37, at 35.

123. *See, e.g.*, PAUL H. HARVEY & MARK D. PAGEL, THE COMPARATIVE METHOD IN EVOLUTIONARY BIOLOGY (1991).

124. *See* RIDLEY, *supra* note 37, at 35. *See also* PLOTKIN, *supra* note 49, at 215.

125. Owen D. Jones, *Sex, Culture, and the Biology of Rape: Toward Explanation and Prevention*, 87 CAL. L. REV. 827, 933 (1999) [hereinafter Jones, *Biology of Rape*].

126. *Id.*

human behavior in those situations where law and economics, particularly as noted by BLE, is inaccurate. In doing so, EA will lead to more effective legal regimes.

A. Jones on Child Abuse and Rape

Professor Owen Jones, briefly discussed in Part II, is the most vocal proponent of modern evolutionary analysis and its application to law, specifically rape and child abuse.[127] His works articulate a particular procedure through which EA can be conducted to help reform current approaches to legal problems.[128] In general, Jones notes:

> A legal system informed by evolutionary analysis might more precisely target, regulate, or otherwise control the existence of, or access to, newly identified associated environmental factors. If environmental factor x increases the likelihood that people in a given society will exhibit behavior y, then one strategy law may pursue to reduce y is to reduce the prevalence of x. . . . A legal system informed by evolutionary analysis might also design programs that take account of evolved motivational links between environmental stimuli and behavior by narrowly tailoring legal regimes to interrupt or weaken them. This could involve invoking the panoply of tools available to society, such as social or educational programs targeted at those most likely to experience the stimuli, incentive programs, or refocused deterrence initiatives.[129]

Jones, relying on prior research,[130] noted that child abuse—in particular infanticide—could be explained by a lack of emotion felt by the abuser toward the victim. While this declaration might seem a bit obvious, Jones arrives at this conclusion after a careful evolutionary analysis. Jones focuses in part on Discriminative Parental Solicitude (DPS) Theory.[131] DPS holds that:

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127. *Id.*; Jones, *Child Abuse*, *supra* note 55.
128. *See, e.g.*, Jones, *Child Abuse*, *supra* note 55, at 1157.
129. *Id.* at 1232-33.
130. *Id.* at 1181 n.170.
131. *Id.* at 1176.

> The precise allocation of a parent's investment among related and unrelated infants is . . . acutely sensitive to the "opportunity cost" of that investment. Natural selection effectively punishes the genetic complements of parents that allocate parental investment in one way whenever similarly situated competitors earn *greater* fitness returns by allocating the same amount of parental investment in *another* way—to different existing or future offspring, for example. Thus, natural selection will favor the ability to deliver parental investment to the offspring most capable of turning that investment into reproductive success. This theory therefore predicts that the motivational mechanisms influencing parental behavior will have evolved in such a way that parents will, on average, act as if they value a particular infant in direct proportion to that infant's probable contribution to parental inclusive fitness.[132]

According to this paradigm, Jones hypothesizes that victims of child abuse will likely be unrelated to the abuser, or, if related, will occur where care for a child is deemed "inefficient" through the lens of reproductive fitness.[133] Jones compiles information to show

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132. *Id.*

133. *Id.* at 1178. Given the import of such an assertion, it seems an appropriate time to remind the reader of the naturalistic fallacy. This concept directs that simply because evolution states a prediction, these forecasts come attached with no normative conclusions. For example, while DPS might predict that harming children is sometimes favorable with respect to both inclusive and reproduction fitness, *we should not conclude that child abuse is acceptable.* It is, in fact, more than clear that it is not. Also, simply because behavior is *in part* influenced by genes, it does *not* excuse an actor of responsibility or hold that culture plays no role in human actions. *See, e.g.*, PINKER, *supra* note 18, at 46–47.

Another way to come to the naturalistic fallacy is to return to micro-evolution and selfish gene theory. *See* DAWKINS, *supra* note 45. Recall that evolution is about genes replicating themselves and not about human reproduction *per se.* Accordingly,

> the gene-centered theory of evolution does *not* imply that the point of all human striving is to spread our genes. . . . People don't selfishly spread their genes; genes selfishly spread themselves. They do it by the way they build our brains. By making us enjoy life . . . the genes buy a lottery ticket for representation in the next generation, with odds that were favorable in the environment in which we evolved. . . .
>
> Sexual desire is *not* people's strategy to propagate their genes. It's people's strategy to attain the pleasures of sex. . . . Just as blueprints don't necessarily specify blue buildings, selfish genes don't necessarily specify selfish organisms."

PINKER, *supra* note 18, at 43–44.

While our genes may hope we act in a particular way, should that method be immoral or grate against societal norms, its commands must be escaped. As Dawkins notes, "We, alone on earth, can rebel against the tyranny of the selfish replicators." DAWKINS, *supra* note 45, at 215.

that the data are largely (often overwhelmingly) consistent with predictions based on DPS theory.[134]

Professor Jones goes on to show how this evolutionary insight can be integrated with or amend traditional views of child abuse to yield more precise and effective prevention measures. The insight of DPS, for example, modifies current behavioral models.[135] This reformulation presents options for new legal strategies to alleviate child abuse.[136] Jones notes how present models of child abuse argue that the behavioral disposition to harm children is learned.[137] Accordingly, legal responses focus on things such as public awareness and parent education programs.[138] EA, however, claims that reforms that take note of evolutionary predictions can better respond to abuse. Since, for example, stepparents are more likely to feel less solicitude towards their stepchildren and consequently abuse them, perhaps resources might be better directed to focus on prevention or monitoring abuse within this group.[139] Courts might also focus on deterring abuse by providing a heightened legal standard for stepparents or, in a custody battle, award care to biological parents.[140]

Jones approaches rape from a similar perspective. Perhaps "natural and sexual selection have operated over long periods of evolutionary history to preserve and spread psychological predispositions, in males, to correlate psychological states tending to increase the likelihood of forceful copulation with circumstances that would, on average, have made forced copulation more adaptive than alternative behaviors during the environment of evolutionary adaptation."[141] After a detailed analysis, Jones notes how this evolutionary phenomenon can modify the current discourse on rape.

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134. Jones, *Child Abuse, supra* note 55, at 1193–1211.

135. *Id.* at 1227.

136. *Id.* at 1232.

137. *Id.* at 1233.

138. *See id.* (listing a number of current responses aimed at curbing child abuse).

139. *Id.* at 1234.

140. *Id.* at 1235. Jones proffers other examples as well. In doing so, he admits that "the spectrum of *possible* legal strategies informed by evolutionary analysis can range from the most restrictive and absurd, such as outlawing divorce, to the least restrictive and passive.... Between will often lie plausible and achievable strategies that, combined with other efforts, may significantly improve a society's ability to achieve its established goals." *Id.*

141. Jones, *Biology of Rape, supra* note 125, at 910. In light of the naturalistic fallacy discussed at note 133, Jones also carefully notes that "[i]t does not follow ... that rape is inevitable.... It does not follow that the legal system should be less aggressive about preventing rape .... It does not follow that accused rapists should be allowed to raise biology in furtherance of exculpatory arguments, claiming that male evolved psychology absolves them from guilt." *Id.* at 910–11.

One category that should be reconsidered is the understanding of what motivates rapists. Professor Jones writes:

> There is simply a great deal of evidence, consistent with narrow, falsifiable, and parsimonious predictions, derived from robust foundations of behavioral biology, suggesting that rape is frequently influenced, at least in part, by nonrandom, context-specific, information-processing predispositions typical to the male brain of many species, including humans. This evidence neither excuses rape when it does occur, nor makes rape determined or inevitable. But it may very well mean that the popular hypothesis that most rape is a product of misogynistic animus . . . is overcredited.[142]

In light of this, Jones argues that the now defunct Violence Against Women Act of 1994 (VAWA),[143] which attempted to provide a private remedy for acts of violence motivated by gender, may not afford the most effective response to rape.[144] He also adds that legal regimes should recognize the evolutionary underpinnings of rape—particularly the behavioral differences between men and women—when fashioning relevant legal rules.[145] Among other things, noting these behavioral differences requires legislators to consider preventative measures, laws, and punishments often overlooked in the past. If, for example, male sexual behavior, as selected for during evolution, is a primary motivation for rape, Jones notes legislators and ethicists might debate chemical castration of repeated rapists.[146]

B. EA and Employment Discrimination

Jones' analyses identified a legal problem and attempted to demonstrate how a better understanding of human behavior obtained through evolutionary analysis could improve the law's

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142. *Id.* at 923–24.

143. 42 U.S.C. § 13981 (1994). The Supreme Court, by a 5–4 margin, found the VAWA an unconstitutional extension of Congressional power. United States v. Morrison, 120 U.S. 1740 (2000). Despite this outcome, Jones' discussion of VAWA is still informative of how EA can aid legal discourse and policy formulation.

144. Jones, *Biology of Rape*, *supra* note 125, at 921–25.

145. *Id.* at 910–22.

146. *Id.* at 913. Note that Jones does not himself advocate chemical castration—he includes the discussion only to demonstrate the implications evolutionary analysis has for rape laws.

response. EA can play a similar role when incorporated with BLE and other discussions of human cognition. Mainly, EA can show that where the law improperly describes human behavior, regulations are unable or less likely to remedy or prevent legal problems. One field fraught with an incomplete understanding of behavior is employment discrimination.

Title VII of the Civil Rights Act of 1964 makes it unlawful for an employer to make an adverse employment decision against an individual because of that person's race, color, religion, sex or national origin.[147] At heart, Title VII seeks to extend equal opportunities for employment to all individuals. As noted by the Supreme Court in *Griggs v. Duke Power Co.*,[148] "The objective of Congress in the enactment of Title VII is plain from the language of the statute. It was to achieve equality of employment opportunities and remove barriers that have operated in the past to favor an identifiable group of white employees over other employees."[149] Among other things, Title VII seeks to eradicate the use of stereotypes by employers in choosing to hire, promote, fire or otherwise change the working conditions of employees.[150]

Plaintiffs can assert claims under Title VII via two routes: disparate treatment[151] or disparate impact[152] theories. Justice Stewart articulated the difference between the two approaches in *Int'l Bd. Of Teamsters v. United States.*[153] He wrote:

> "Disparate treatment" . . . is the most easily understood type of discrimination. The employer simply treats some people

147. 42 U.S.C. § 2000(e) (2000). The Age Discrimination Employment Act (ADEA) extends a similar protection to those over the age of 40. 29 U.S.C.A. § 631–634 (1985).

148. 401 U.S. 424 (1971).

149. *Id.* at 429–30.

150. *See* Adams v. Fla. Power Corp., 255 F.3d 1322, 1326–27 (11th Cir. 2001) ("[T]he purpose of the ADEA, like the purpose of Title VII and the ADA, is to eradicate employment discrimination based on the stigmatizing stereotypes of age, race, gender or disability."); Trotta v. Mobil Oil Corp., 788 F. Supp. 1336, 1350 n.1 (S.D.N.Y. 1992) (citing Andrews v. City of Philadelphia, 895 F.2d 1469, 1483 (3rd Cir. 1990)) ("[o]ne purpose of Title VII was 'to prevent the perpetuation of stereotypes and sense of degradation which serve to close or discourage employment opportunities for women.'"); Hiatt v. Union Pacific R.R. Co., 859 F. Supp. 1416 (D. Wyo. 1994); Holness v. Penn State Univ., 98-2484, 1999 WL 270388, at *1, *7 (E.D. Pa, May 5, 1999)(stating that Title VII protects those individuals whose employers judge "on stereotypical ideas and beliefs, not merit.").

151. Disparate treatment theory was originally formulated in *McDonnell Douglas Corp. v. Green*, 411 U.S. 792 (1973). It was later modified by *Texas Dep't of Community Affairs v. Burdine*, 450 U.S. 248 (1981).

152. Disparate impact was first made available to plaintiffs in *Griggs*, 401 U.S. 424 (1971).

153. 431 U.S. 324, 327, 335–36 (1977) (Stewart, J., concurring in part, dissenting in part).

> less favorably than others because of their race, color, religion, sex or national origin. Proof of discriminatory motive is critical. . . . [Disparate impact] involve[s] employment practices that are facially neutral in their treatment of different groups but that in fact fall more harshly on one group than another and cannot be justified by business necessity.[154]

Of particular interest to this Note is the disparate treatment model, which requires a showing of an intent to discriminate.

Recent legal scholarship that couples psychology and cognition to understand stereotyping as it relates to discrimination question the behavioral assumptions that underlie Title VII and related case law.[155] In part, studies note that discrimination does not come conveniently packaged with conscious motive or intent to discriminate. Rather, the brain automatically forms and uses stereotypes that unconsciously bias decision makers and result in discrimination.

To understand this, we need to examine again how people think through a discussion of evolution and cognition. As discussed above, human beings can see based on a perceptive heuristic.[156] We are able to decipher visuals because we match what we see with our generic impressions of colors and shapes present in the world. Similarly, it appears that the brain developed a capacity to make decisions relative to environmental factors based on categorical impressions about these elements. After visually identifying an object, a person can recall its properties and appropriately use it. In the past, if we categorized something as a rock we would have known to use it as a tool rather than attempt to eat it. Such a mechanism is necessary because without the ability to categorize, one would have to approach every object he or she saw as an unknown entity and "experiment" with it to relearn its properties. We might have to take a bite out of every rock!

While this example seems rather simple, "[w]hat is a matter of mere convenience in this mundane example can become literally a question of life or death in more threatening environments."[157] As Professor Krieger notes:

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154. *Id.* at 335–36 n.15.

155. *See* Linda Hamilton Krieger, *The Content of Our Categories: A Cognitive Bias Approach to Discrimination and Equal Opportunity Employment*, 47 STAN. L. REV. 1161, 1165 (1995); Ann C. McGinley, *!Viva La Evolución!: Recognizing Unconscious Motive in Title VII*, 9 CORNELL J.L. & PUB. POL'Y 415, 418–19 (2000); Amy L. Wax, *Discrimination as Accident*, 74 IND. L.J. 1129, 1131–32 (1999).

156. *See supra* notes 50–53 and accompanying text.

157. RUPERT BROWN, PREJUDICE: ITS SOCIAL PSYCHOLOGY 42 (1995). Brown explains:

> Every person, and perhaps even every object that we encounter in the world, is unique, but to treat each as such would be disastrous. Were we to perceive each object *sui generis*, we would rapidly be inundated by an unmanageable complexity that would quickly overwhelm our cognitive processing and storage capabilities. Similarly, if our species were "programmed" to refrain from drawing inferences or taking action until we had Every person, and perhaps even every object that we encounter in the world, is unique, but to treat each as such would be disastrous. Were we to perceive each object *sui generis*, we would rapidly be inundated by an unmanageable complexity that would quickly overwhelm our cognitive processing and storage capabilities. Similarly, if our species were "programmed" to refrain from drawing inferences or taking action until we had complete, situation-specific data about each person or object we encountered, we would have died out long ago.[158]

This capacity is an automatic heuristic—whether or not we choose to do so, our brain organizes objects into categories and relies on the characteristics associated with these groupings to generate predictions about the observed entities.

> [T]he world is simply too complex a place for us to be able to survive without some means of simplifying and ordering it first. . . . We simply do not have the capability to respond differently to every single person or event that we encounter. Moreover, even if we did have that capacity, it would be highly dysfunctional to do so because such stimuli possess many characteristics in common with each other . . .

Id. at 41–42.

158. Krieger, *supra* note 155, at 1188. *See also* Eleanor Rosch, *Human Categorization*, *in* 1 STUDIES IN CROSS-CULTURAL PSYCHOLOGY 1, 1–2 (Neil Warren ed., 1977) ("Since no organism can cope with infinite diversity, one of the most basic functions of all organisms is the cutting up of the environment into classifications by which non-identical stimuli can be treated as equivalent."); Wax, *supra* note 155, at 1144 ("The mind has evolved methods that strike an overall compromise between the costs and benefits of attending to the full array of individualized information available in multiple social encounters. The repeated use of 'quick and dirty' mental rules of thumb may function most efficiently in the aggregate, but may not represent the best method case by case.").

Some believe that stereotyping is not simply a function of cognitive categorization. *See* McGinley, *supra* note 155, at 421–26. There is also a debate as to whether this automatic process can be controlled. *Compare* John A. Bargh, *The Cognitive Monster: The Case and Controllability of Automatic Stereotype Effects*, *in* DUAL PROCESS THEORIES IN SOCIAL PSYCHOLOGY 361 (Shelley Chaiken & Yaacov Trope eds., 1999) *with* Galen Bodenhausen et al., *On the Dialectics of Discrimination: Dual Processes in Social Stereotyping*, *in* DUAL PROCESS THEORIES IN SOCIAL PSYCHOLOGY 271 (Shelley Chaiken & Yaacov Trope eds., 1999).

Like the tendencies discussed by Professor Jones' time shifted rationality,[159] this capacity serves us well in contexts similar to the EEA, but proves problematic given novel applications. Categorization, for example, results in stereotypes. These stereotypes may be appropriate for identifying a person or distinguishing a tree from a car. But, given our society's normative values, they play an impermissible role in our categorization and generalizations about the characteristics of certain genders, races, and ages.[160]

Social cognition theory elucidates the connection between categorization and stereotypes. As Susan Fiske notes, "[the central assumption of] [r]esearch on the cognitive bases of stereotyp[es] ... is that stereotyping is based on categorization, and that when people stereotype, they categorize others in order to simplify the tasks of social cognition and thus to maximize scarce cognitive resources."[161] As Krieger adds, "[a]ccording to this view, stereotypes, like other categorical structures, are cognitive mechanisms that *all* people, not just 'prejudiced' ones, use to simplify the task of perceiving, processing, and retaining information about people in memory. They are central, and indeed essential to normal cognitive functioning."[162] By this rationale, people constantly unconsciously apply stereotypes when judging others.

This reality produces serious ramifications for Title VII. If stereotyping and the corresponding bias are so prevalent, those instances of discrimination susceptible to Title VII regulation and its required showing of conscious intent must be drastically under-inclusive.[163] Additionally, the natural tendency of an adaptive brain to use stereotypes makes it that much more difficult to meet Congress's goal of eradicating the role of stereotyping in employment decisions.[164]

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159. *See supra* note 58 and accompanying text.

160. As Professor Pinker notes, our minds make "a leap of faith about how the world works, by making assumptions that are indispensable but indefensible—the only defense being that the assumptions worked well enough in the world of our ancestors." PINKER, *supra* note 18, at 30. Though we may not like the fact that the brain evolved to differentiate people based on visual clues, it is a valuable tool. At the same time, we need not defend this habit simply because it is innate. We need not defend the "indefensible."

161. Susan T. Fiske, *Examining the Role of Intent: Toward Understanding Its Role in Stereotyping and Prejudice*, *in* UNINTENDED THOUGHT 253, 253 (James S. Uleman & John A. Bargh eds., 1989).

162. Krieger, *supra* note 155, at 1188.

163. McGinley, *supra* note 155, at 418–19 ("[I]t is likely that differential treatment of a female or minority employee in the workplace is because of his race or her gender, even though the employer is unaware that race or gender motivated the differential treatment. A rule limiting the definition of discrimination to cases where the employer consciously treated an employee differently because of membership in a protected class ... narrows the effectiveness of the statute.").

164. *See supra* note 150 and accompanying text.

Stereotyping as an innate cognitive function also forces us to question the effectiveness of the pretext analysis articulated in *McDonnell Douglas v. Green.*[165] This standard articulates that employers use rational models when making employment decisions. If a plaintiff can prove that he or she is a member of a protected class, applied for the job, is qualified, and was denied employment and the defendant cannot proffer a non-discriminatory reason for the adverse employment decision, the presumption is that the employer discriminated in hiring. "Pretext analysis thus rests on the assumption that, absent discriminatory animus, employment decision makers are rational actors."[166] After all, "more often than not people do not act in a totally arbitrary manner, without any underlying reasons, especially in a business setting. Thus, when all legitimate reasons for rejecting an applicant have been eliminated as possible reasons for the employer's actions, it is [likely that the employer based his decision on impermissible grounds]."[167] Social cognition, as motivated by evolution, however, shows that people are not rational information processors. Consequently, the assumptions embodied in pretext analysis are false.[168]

Given the realities exposed by EA and cognition, Title VII might be revised to better protect victims of employment discrimination. In light of its adaptive fit and automatic heuristic, categorization could likely not be eradicated.[169] However, there are ways the law may correct for it. Perhaps liability could be extended for unconscious stereotyping by expanding the definition of intent.[170] Also, the pretext model could be abandoned,[171] or, in a case where an employer does not take active measures to counter the hiring staff's natural tendencies, the presumption could be that the employer intended these categorical and prejudiced views to influence the outcome of employment decisions.

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165. Krieger, *supra* note 155, at 1177–78 (discussing *McDonnell Douglas v. Green*, 411 U.S. 792 (1973)).

166. *Id.* at 1181 (discussing the implications of *Furnco Construction Corp. v. Waters*, 438 U.S. 567 (1978)).

167. Furnco Constr. Corp. v. Waters, 438 U.S. 567, 577 (1978).

168. One might argue that social cognition supports the pretext model. If a qualified member of a protected class is not hired, the decision must have been based on innate stereotyping and accordingly prejudice. But as Krieger points out, there is more to it. Employers otherwise fair and who honestly allege they are not prejudiced, whose justifications were not believed would not be deemed a liar *per se*, but someone unable to recognize and counteract the affects of natural human cognition. *See* Krieger, *supra* note 155, at 1242.

169. *Id.* at 1239–40.

170. *Id.* at 1242–43.

171. *Id.* at 1241–42.

Additionally, given the inevitable nature of stereotyping and the corresponding bias (prejudice) it has on decision makers, programs other than Title VII might better combat discrimination in employment. Though the science is still developing, studies may reveal a hierarchy to cognition. There may be a means for us to, in a sense, program our brains to abandon attaching characteristics to an individual after we place him or her into a category. For example, we would utilize categorization to help us tell that Sameer is a male, South-Asian, and twenty-something (something we would need to do in order not to forget him) but not attach the corresponding stereotypes. If this is impossible, flooding decision makers with information or experiences that counter stereotypes might shift the characteristics expected of a category and, in essence, preclude prejudicial inferences.

In the alternative, we could focus on other cognitive processes to screen out stereotypes that have been triggered. As Macrae and Bodenhausen have proposed:

> In order to successfully propel their owners through complex and demanding social environments, minds must be equipped with two complementary cognitive skills. On the one hand, they must sensitize perceivers to the invariant features of their immediate stimulus worlds. . . . Knowing what to expect . . . is information that renders the world a meaningful, orderly, and predictable place. On the other hand, however, to guide behavior in a truly flexible manner, minds must also be responsive to the presence of unexpected . . . stimulus inputs. An adaptive mind, after all, is one that enables its owner to override automated action plans and produce novel behavioral outputs as and when these responses are required.[172]

If evolution generated a brain capable of stereotyping, it may have also produced a mind able to circumvent stereotyping through an alternative cognitive pathway.

Also note that studies show that the categorization may be controlled. Implicitly operating goals can counter stereotype activation; individuals with egalitarian goals, for example, did not rely on stereotypes in their judgments.[173] If true, companies could

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172. C. Neil Macrae and Galen V. Bodenhausen, *Social Cognition: Thinking Catergorically About Others*, 51 ANN. REV. PSYCHOL. 93, 93–94 (2000) (citations omitted).

173. *See* Gordon B. Moskowitz et al., *Preconsciously Controlling Stereotyping: Implicitly Activated Egalitarian Goals Prevent the Activation of Stereotypes*, 18 SOC. COGNITION 151 (2000).

focus on instilling similar mindsets in their employees. This is, no doubt, a daunting task, but necessary to meet the goals of Title VII.

At heart, this Note is not specifically concerned with these proposed reforms and their merits. Scholarship such as Krieger's does an excellent job of that, and this author is ill equipped to add to the discussion. Instead, this examination of employment discrimination intends to demonstrate that EA and its derivative theories can show us the need to revise legal approaches in light of substantial misunderstanding of human behavior.

CONCLUSION

This Note proceeded as follows. It first described the promise and limits of behavioral law and economics. The Note then went on to detail the need for observations provided by BLE to be subsumed under a theory. Next, it noted why evolution provides a good theoretical backing for BLE's observations. This came as no surprise given the brain's control over behavior. The Note followed with some concrete examples of EA, moved on to critiques of the movement, and mitigated the strength of those criticisms by pointing out the promise of unproven theories, a responsible scientific method, and scientific advancement. All along, the purpose of this path has been to defend evolutionary analysis of the law.

At the same time, this Note does not hold that EA can provide all of the answers, or that it needs to. Law and economics generally does a good job as a predictive device. EA should only be used in addition to law and economics for two reasons. First, EA can fill in the gaps and refine the assumptions of law and economics. This is probably the most valuable application of evolutionary studies to the law. Second, evolution may provide the general predictive theory that social science has long sought. This is by far the more global objective. Whether or not each of these ends will be attained is uncertain. At the very least, however, evolutionary analysis and the law presents strong promise.